In contrast, in the present invention, the claimed gating and amplification functions are performed by a single element. The only embodiments of a gating and amplification means are a single element – the semiconductor optical amplifier (SOA) 14, 82 (or, as recited in claim 3, a gain-clamped SOA. See, for example, paragraphs 15 (p. 4); 73 (p. 12); 116 (p. 21); and 200 (p. 38. Paragraph 200 in particular describes this aspect as advantageous.

This is not taught by Cooper. Cooper discloses (col. 3, line 55 to col. 4, line 20) an optical modulator to perform the gating or switching action (col. 3, line 58) and a separate optical amplifier which is operable to amplify the optical signals in the sensor system before being directed to the optical modulator (col. 3, line 67 to col. 4, line 2).

Claims 1 and 15 of the present application require a single optical amplifying and gating means which performs both functions, i.e. operable to simultaneously gate and amplify optical signals returned from the reflective optical elements.

With regard to claim 2, the Examiner has stated that Cooper discloses a switchable amplifier at column 10, lines 56-67. Applicants respectfully disagree. Cooper describes an erbium doped fibre amplifier (EDFA) plus an optical isolator (to prevent the amplification of spurious reflections) at column 10, lines 56-67. EDFAs cannot perform the required switched operation, i.e. they cannot operate as switchable amplifiers. Therefore, Applicants submit that this claim is patentable for this additional reason as well.

With regard to claim 3, the Examiner considers that it would have been obvious to modify Cooper in order to use a semiconductor optical amplifier (SOA) or a gain-clamped SOA. However, although SOAs are known in the art, the use of an SOA to perform the functions of both an optical gate and an optical amplifier is not. There is no teaching by Cooper that an SOA could be used to

perform both of these functions, as required by claim 3 of the present application. Therefore, Applicants submit that this claim is patentable for this additional reason as well.

Even assuming *arguendo* that the skilled person did choose to modify Cooper to use an SOA, he would simply replace the EDFA of Cooper with an SOA. The SOA would therefore only perform pulse amplification, with the optical modulator of Cooper performing pulse gating.

With respect to claim 4, at column 10, lines 56-67 Cooper discloses the use of a 980nm semiconductor laser for optically pumping the EDFA. This is standard practice and is well known in the art. An EDFA amplifier must be optically pumped in order that the population inversion required for the erbium doped fibre to act as a gain medium is achieved.

The drive apparatus of present claim 4 is operable to generate electrical drive pulses and to cause the optical amplifying and gating means (the SOA) to switch on and off, i.e. to gate. The optical pump source for the EDFA of Cooper is clearly not drive apparatus since it does not generate electrical drive pulses and it does not cause any device to switch on and off. Therefore, Applicants submit that this claim is patentable for this additional reason as well.

With respect to claims 5 and 6, Applicants respectfully disagree with the Examiner's statement that it would have been obvious to modify Cooper's optical source by coupling with the amplifier to improve the output signal. In claim 5 the optical amplifying and gating means also acts as the optical source; optical pulses are generated as a result of simultaneously generating amplified spontaneous emission and gating this into an optical pulse. The claimed device does not improve the output signal, as the Examiner appears to believe it does, it generates the optical pulses. In Cooper there is a separate pulse source (12). The optical amplifying and gating means of the present claim replaces the pulse source of Cooper.

There is no teaching or suggestion in Cooper that an optical amplifying and gating means could operate in this way, to serve additionally as an optical source operable to generate optical pulses. There is also no teaching in Cooper that it would be desirable to combine all of these functions in a single device.

In claim 6 the optical amplifying and gating means acts as part of the optical source, acting to gate an optical signal generated by an SLED into optical pulses. This arrangement does not improve the output signal, it generates the optical pulses. The SLED plus the optical amplifying and gating means replaces the pulse source of Cooper.

There is no teaching or suggestion in Cooper that an optical amplifying and gating means could operate in this way, to additionally gate an optical signal into optical pulses. There is also no teaching in Cooper that it would be desirable to combine the functions of gating an optical source into pulses, amplifying pulses returned by Bragg sensors and gating the returned pulses to the detector in a single device.

With regard to claim 7, the Examiner is correct that Cooper discloses source for generating optical pulses. However, Cooper does not disclose the use of such an optical pulse source as part of a system having the features of claim 1.

With regard to claim 8, the Examiner is correct that photodetectors are known devices. Cooper, however, requires the use of wavelength detection means, so Applicants submit that it would not have been obvious to modify Cooper to use a photodetector, since these can only measure optical signal power and not wavelength.

Concerning claim 9, Cooper does not disclose or suggest a wavelength detector as part of a system as claimed in claim 1.

With respect to claims 10-13, Applicants respectfully point out that the claimed features do not relate to system efficiency. In claim 10, the section of optical waveguide is provided to "remove the possibility of interference from simultaneous reception at the SOA [optical amplifying and gating means] of reflected pulses from more than one grating", as explained at page 16, paragraph 91. There is no teaching or suggestion in Cooper that this problem would even be experienced in Cooper's system.

In claims 11 to 13, the optical signal routing means route an optical signal returned from a reflective optical element to be interrogated back through the optical amplifying and gating means, and back towards the said reflective element. This feature causes pulses to cycle round the system, undergoing multiple amplification and reflection, as described at page 25, paragraph 138 to page 27, paragraph 145.

There is no teaching or suggestion in Cooper that it would be desirable to cause pulses to undergo such multiple amplification and reflection by being repeatedly cycled round the system. Indeed, such recycling in order to increase the optical power of the returned pulses is not required in the system of Cooper due to the presence of the EDFA for amplifying returned pulses prior to their being gated by the optical modulator.

The skilled person would not have had any motivation to modify Cooper to include the features defined in these claims, and it would therefore clearly not simply have involved routine skill in the art to go from the system described to Cooper to the system defined in claims 10-13.

With regard to claims 14 and 17, assuming for the sake of argument that Cooper appears to disclose the use of Bragg gratings having spectral profiles which cover different spectral ranges, as required by claim 14 (this aspect being known as wavelength division multiplexing), Applicants

submit that Cooper does not disclose or suggest the features of claim 17, which recites the use of sensor gratings each having a resonant wavelength lying within the same wavelength window. Therefore, Applicants submit that this claim is patentable for this additional reason as well.

Cooper does not disclose the use of a spaced array of gratings as part of a system as defined in claim 15. Therefore, Applicants submit that claim 15, and claim 16 which depends from calim 15, are patentable for this additional reason as well.

With respect to claims 18 and 20, the Examiner considers that it would have been obvious to modify Cooper to use groups of arrays to use the system in different environments. However, neither claim 18 nor claim 20 relates to the operation of the system in different environments. Claim 18 defines an array of gratings which makes use of both time division multiplexing (for gratings within a group) and wavelength division multiplexing (for the different groups). Claim 20 defines a system in which a plurality of arrays of gratings are provided, each being coupled to a respective optical amplifying and gating means.

There is no teaching or suggestion in Cooper that would have led the skilled person to use an array of gratings as defined in claim 18, or a plurality of arrays and optical amplifying and gating means as defined in claim 20. Therefore, Applicants submit that these claims are patentable for these additional reasons as well.

With regard to claim 19, it appears that the Examiner considers that the F-P etalon or mirror would have been known and that therefore it would have been an obvious step to modify Cooper to use F-P etalons. Cooper relates to the use of fibre Bragg grating sensors only. There is no teaching or suggestion in Cooper that any other type of reflective optical element could be used as a sensor

element, and specifically, that an F-P etalon device could be used as a sensor. Therefore, Applicants submit that this claim is patentable for this additional reason as well.

Pursuant to the foregoing discussion, Applicants submit that all of claims 1-20 are patentable.

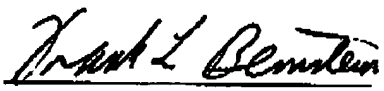
Request for Allowance

In view of the above remarks, Applicant respectfully requests that the Examiner reconsider and allow this application. If, in the opinion of the Examiner, an interview would expedite the prosecution of this application, the Examiner is invited to call the undersigned attorney at the telephone number listed below.

The Office is hereby authorized to charge any fees, or credit any overpayments, to Deposit Account No. **11-0600**.

Respectfully submitted,
KENYON & KENYON

Dated: March 1, 2005

By: 
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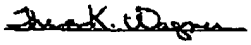
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